

**THE COPEPOD *Hemicyclops aberdonensis* (POECILOSTOMATOIDA: CLAUDIDIIDAE) AND ITS SUSPECTED HOST THE BURROWING SHRIMP *Calocaris macandreae* IN THE FIRTH OF CLYDE**

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The copepod family Clausidiidae contains several genera which live as commensals within the tubes or burrows of larger invertebrates (see Vervoort & Ramirez, 1966). *Hemicyclops* is by far the largest genus within the family with over 30 species recognised worldwide. Although *Hemicyclops* spp. are free swimming and are often recovered in benthic plankton hauls, many of the species are also known to co-habit with other invertebrates. These include a sponge, a coral, a gastropod, a bivalve and an echinuran, but the most frequent hosts are burrowing crustaceans or polychaetes (Boxshall & Humes, 1987).

Only three species *H. purpureus* Boeck, 1872, *H. aberdonensis* (T. & A. Scott, 1892), and *H. cylindracea* (Pelseneer, 1929) have been recorded from British waters. Of these only *H. cylindracea* is associated with any invertebrate, being found within the mantle cavity of the bivalve *Loripes lacteus* (see Gotto, 1993). *H. aberdonensis* is readily distinguished from the other two by the acute lateral protuberances on the genital segment.

In October 1992, during a routine benthic grabbing survey in Irvine Bay, Firth of Clyde, 8 female *H. aberdonensis* were recovered from a single grab of soft mud at SEPA Stn. E. (55° 33.60'N, 04°46.60'W, depth 53m). Although 38 grab samples were collected in Irvine Bay over 19 stations on the same survey, only one contained any *H. aberdonensis*. It is possible that the copepods came from sea-water hoses used to sieve the sediment samples. Most of the samples contained large calanoid copepods which almost certainly originate from the hose washing water. However the fact that the *H. aberdonensis* were recovered from only a single grab strongly suggests that they were living in close association with one of the invertebrates therein. The invertebrate fauna of the sample comprised 75 polychaetes (15 sp.), 17 nemerteans (2 sp.), 8 bivalves (3 sp.), 2 juvenile brittle stars, 1 amphipod, 1 decapod and 18 calanoid copepods. All of these are rather small to act as suitable host candidates with the exception of a single specimen of the burrowing decapod *Calocaris macandreae*. As this was the only adult *C. macandreae* recovered in the survey and burrowing decapods are one of the most frequent type of host for clausidiid copepods, it seems probable that the *H. aberdonensis*

were co-habiting within the decapods' burrow. This case is strengthened by the discovery of an additional single female *H. aberdonensis* from 1 of 5 grab samples collected off Cloch Point (SEPA Stn.CMT7. 55° 56.85'N, 04° 53.65'W, depth 80m) in April 1999. Again only the grab sample with the copepod had a *C. macandreae* present.

The *C. macandreae* specimen from Irvine Bay had a total length of 5cm (carapace length 1.7cm) and was also festooned with growths of the ctenostome bryozoan *Triticella flava* (Syn. *T. koreni*, see Hayward, 1985) on its rostrum and tail. Although the biology of *C. macandreae* has been studied in some detail, the only associate mentioned is the bryozoan epibiont (Buchanan, 1963; Eggleston, 1971). However, even if *H. aberdonensis* were regular co-habitants with *C. macandreae*, it is likely that the copepods would become separated from their host during normal sampling procedures. Recovery of copepods with *C. macandreae* would require in-situ sampling. As *C. macandreae* is quite abundant in some parts of the Clyde and the burrows are readily recognisable (Atkinson, 1986) it would be feasible for SCUBA divers to extract individual shrimps and their co-habitants from such burrows using a bait-pump or similar device.

The original description of *H. aberdonensis* is based on several specimens, both male and female collected in a bottom tow-net in Aberdeen Bay in 1891. In 1968 Hamond described a single male *Hemicyclops* sp., also collected in a bottom plankton net, off the coast of Norfolk. Hamond considered his specimen bore a striking resemblance to *H. aberdonensis* although there were a few discrepancies from the type description. A single female *H. aberdonensis* has since been recovered with a suction sampler in Dublin Bay and numerous males, females, and juveniles were collected using a light trap in Lough Ine, County Cork and at Carnac, Brittany (Holmes, 1985; Holmes, 1986; Holmes & O'Connor, 1991). Holmes (1986) commented on the inadequacy of the original description of this species and suggested that the original drawing of a female may have been based on a juvenile male. He regarded Hamond's male *Hemicyclops* sp. as clearly representing the male of *H. aberdonensis*.



The material from the Clyde throws some light on this problematical species. All the specimens appeared to be adult females (size range 1.3 - 1.5 mm excluding caudal setae) with a body shape similar to that depicted by T.& A. Scott (1892). However the genital segments are fused and thus only 3 post-genital segments are evident. The shape of the genital segments in the original figure of the female is more consistent with it being a genuine female rather than a male. The fact that the genital segments are figured with a clear segmental division may indicate the specimen was immature or may simply be an illustrative error. The acute lateral protuberances on the genital segments are one of the most distinguishing features of both sexes of this species.

One of the Irvine Bay specimens was dissected and mounted for more detailed observations of the antennae, mouthparts and legs (periopods P.1 to P.4). The antennules (A1), antennae (A2), mandibles (Md), and maxillules (Mx1) are identical to those illustrated by Hamond for his male. The maxilla (Mx2) has two plumose setae on the first segment, as in the type description. The two setae are positioned close together, side by side. As one is slightly smaller it is quite easy for it to be obscured by the larger seta. This may explain why Hamond only observed one such seta in his male.

The formula for the arrangement of setae and spines in the Clyde female is as shown below (Arabic nos. = setae, Roman nos. = spines, first number is inner side of segment; second number is outer):

Leg /Segment		Endopodite	Exopodite
Leg 1 (P.1)	1	1 + 0	0 + I
	2	1 + 0	1 + I
	3	5 + I	4 + IV
Leg 2 (P.2)	1	1 + 0	0 + I
	2	2 + 0	1 + I
	3	3 + III	5 + IV
Leg 3 (P.3)	1	1 + 0	0 + I
	2	2 + 0	1 + I
	3	2 + IV	5 + IV
Leg 4 (P.4)	1	1 + 0	0 + I
	2	2 + 0	1 + I
	3	1 + IV	5 + III

This is similar to that illustrated for the male by Hamond except:

P.1, exp.3, innermost spine is very slender and "seta-like".

P.3, exp. has three segments with formula: 0 + I, 1 + I, 5 + IV.

P.4, end. 3, the single inner seta is short, robust and somewhat "spine-like" (fig. 1).

P.4, exp. 3 has three spines as in Hamond's formula (However Hamond's P.4 figure only shows 2 spines but there is a distinct gap between them suggesting that one spine may have fallen off.)

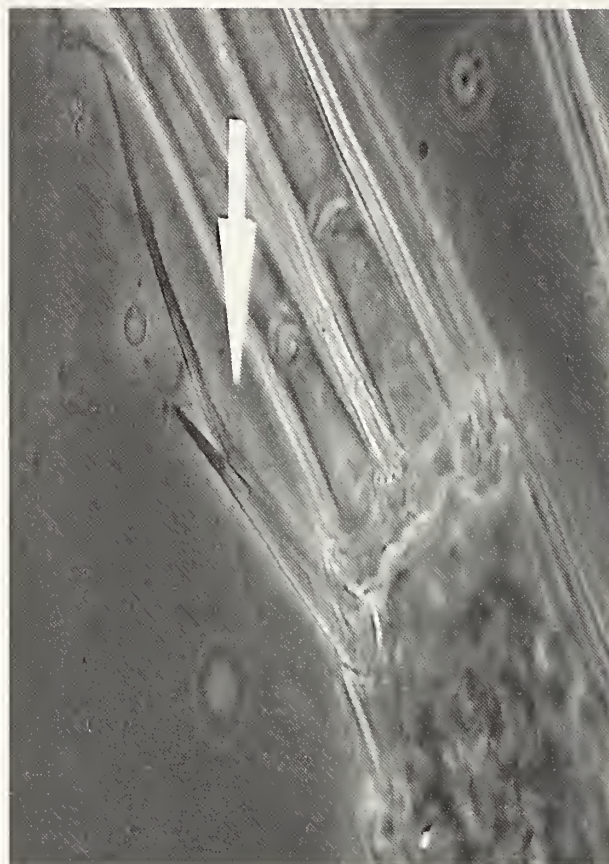


Fig 1. (see text)



Fig 2. (see text)

Hence the main difference between the legs of the Clyde female and Hamond's male lies in the exopod of the third leg (P.3.exp.) which, in the male, is only two-segmented and has no setae or spines on the first segment and three spines (rather than four) on the last segment. (Note again that a distinct gap between the spines and setae of Hamond's figure for the last exp. segment suggests that one spine may have been dislodged.)

T. & A. Scott figured only the first and fourth legs. Whilst the armature of the first leg is consistent with that of the Clyde material, the figure of the fourth leg appears to have 2 extra setae on the third end. segment and one extra spine on the third exp. segment. As the leg armature does not usually vary within a species it is difficult to explain this discrepancy. It is possible that leg 4 was mixed up with either leg 3 or leg 2 although this would still leave an extra seta (for leg 3 last end. segment), or an extra spine (for leg 2 last end. segment).

Holmes (1986) mentioned that the lateral seta of the caudal ramus had a "curious bifid tip". A similar seta is also present in the Clyde material (Fig. 2). The seta is about the same length as the caudal ramus and has a distinctive furcate structure with a spine-like protrusion on the outer margin about halfway along its length. As Holmes observed this feature on some juvenile type material it may prove a useful additional character for verifying identifications. Despite the inaccuracies of the original description it is now clear that *H.aberdonensis* is a readily recognisable species and is probably much more widely distributed in British waters than the few scant records suggest.

Four whole females from Irvine Bay are deposited in the National Museum of Scotland, Edinburgh (Reg. Nos. NMSZ 2000 074.01-.04).

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